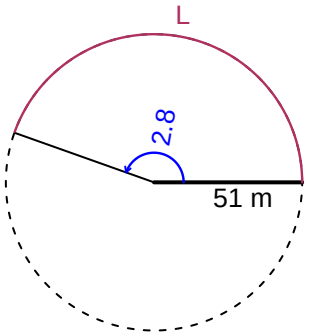
Name: Date:

Trig Final (SLTN v600)

- You can use a calculator (like Desmos)
- You should have a unit-circle with special angles and coordinates marked.

Question 1

In the figure below, we see a circle and a central angle that subtends an arc. The angle measure is 2.8 radians. The radius is 51 meters. How long is the arc in meters?

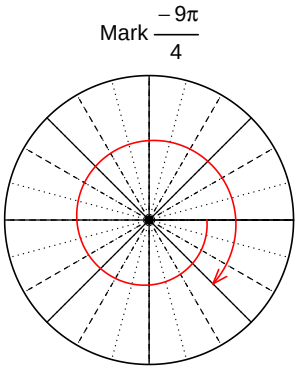


$$\theta = \frac{L}{r} \qquad r = \frac{L}{\theta} \qquad L = r\theta$$

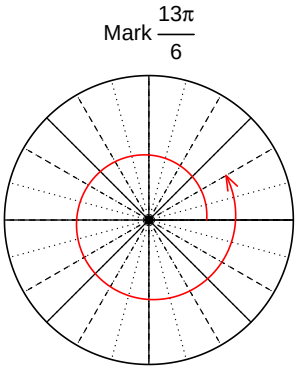
$L = 142.8$ meters.

Question 2

Consider angles $\frac{-9\pi}{4}$ and $\frac{13\pi}{6}$. For each angle, use a spiral with an arrow head to **mark** the angle on a circle below in standard position. Then, find **exact** expressions for $\sin\left(\frac{-9\pi}{4}\right)$ and $\cos\left(\frac{13\pi}{6}\right)$ by using a unit circle (provided separately).



Find $\sin(-9\pi/4)$



Find $\cos(13\pi/6)$

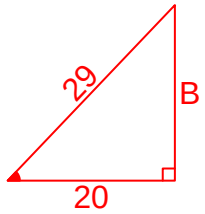
$\sin(-9\pi/4) = \frac{-\sqrt{2}}{2}$

$\cos(13\pi/6) = \frac{\sqrt{3}}{2}$

Question 3

If $\cos(\theta) = \frac{-20}{29}$, and θ is in quadrant III, determine an exact value for $\tan(\theta)$.

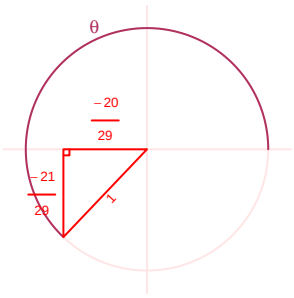
Ignore any negatives and the quadrant, and draw a right triangle (based on SOHCAHTOA) in standard (quadrant I) orientation.



Solve the Pythagorean Equation

$$20^2 + B^2 = 29^2$$
$$B = \sqrt{29^2 - 20^2}$$
$$B = 21$$

Rescale the triangle so the hypotenuse is 1. Reflect the triangle into Quadrant III in a unit circle.



$$\tan(\theta) = \frac{\frac{-21}{29}}{\frac{-20}{29}} = \frac{21}{20}$$

Question 4

A mass-spring system oscillates vertically with a midline at $y = -3.5$ meters, a frequency of 2.11 Hz, and an amplitude of 8.51 meters. At $t = 0$, the mass is at the minimum height. Write an equation to model the height (y in meters) as a function of time (t in seconds).

Any of these equations would get full credit.

$$y = -8.51\cos(2\pi 2.11t) - 3.5$$

or

$$y = -8.51\cos(4.22\pi t) - 3.5$$

or

$$y = -8.51\cos(13.26t) - 3.5$$